

4. AFFECTED ENVIRONMENT

4.1 Introduction

This chapter describes the existing environment at the proposed site for the Kentucky Pioneer Integrated Gasification Combined Cycle (IGCC) Demonstration Project. Specific site information for this environmental impact statement (EIS) was obtained and referenced primarily from the *Final Environmental Impact Statement J.K. Smith Power Station Units 1 and 2 and Associated Transmission Facilities* (J.K. Smith EIS) (REA 1980) and the *Kentucky Pioneer Plant Environmental Information Volume* (EIV) (EIV 2000). The EIV was prepared by Kentucky Pioneer Energy (KPE), LLC, to assist in the U.S. Department of Energy's (DOE) consideration of the Kentucky Pioneer IGCC Demonstration Project as part of the Clean Coal Technology (CCT) Program. The two documents discussed in Section 1.4 of this EIS, the *J.K. Smith Power Station Units 1 and 2 Clark County, Kentucky Environmental Analysis* and the *Combustion Turbine Generation Project Environmental Assessment* were also used to develop this chapter. Where necessary, updated environmental baseline information is presented and documented accordingly.

4.2 Land Use

This section describes the existing and planned land use at the proposed Kentucky Pioneer IGCC Demonstration Project site.

The Kentucky Pioneer IGCC Demonstration Project will be located within a 121-hectare (300-acre) tract of land owned by the East Kentucky Power Cooperative (EKPC) in Clark County, Kentucky. The 121 hectares (300 acres) are located within a 1,263-hectare (3,120-acre) tract owned by EKPC, known as the J.K. Smith Site. The tract is 34 kilometers (21 miles) southeast of the city of Lexington, 13 kilometers (8 miles) southeast of the city of Winchester, and 1.6 kilometers (1 mile) west of Trapp, Kentucky (see Figure 3.1-1).

The project site can be accessed through a gated perimeter fence and an access road off of Kentucky Highway 89. The access road is approximately 1.6 kilometers (1 mile) from Kentucky Highway 89 to the project site (see Figure 3.1-7). Plant access by rail, which crosses the eastern side of the station, will be from the freight rail line owned by CSX Transportation, Inc.

The 1,263-hectare (3,120-acre) tract is located within the Kentucky River Basin. The site is a hilly highland bounded by the Upper Howard Creek on the north and west, the freight rail line on the east, and the Kentucky River on the south. The project area will consist of a 121-hectare (300-acre) tract of land previously graded during site preparation for the abandoned construction of the J.K. Smith Power Station by EKPC. The process area will cover approximately 4.8 hectares (12 acres) of the 121-hectare (300-acre) tract of land.

The J.K. Smith Site lies within the jurisdiction of the Winchester-Clark County Planning Commission, which provides uniform direction through their Comprehensive Plan and Zone Ordinance. The project site lies within the unincorporated portion of Clark County. This area is planned to remain rural and is zoned “agricultural.” The utility structures within the J.K. Smith Site are eliminated from zoning procedures because the Planning Commission does not consider utility structures in determining zoning for an area. Therefore, the three combustion turbines (CTs) at the site and the previously disturbed areas from construction in the 1980s have not affected the current zoning within the J.K. Smith Site. The three gas CTs, owned by EKPC, are located on approximately 19 hectares (48 acres) of land outside of the project site. These turbines are located approximately 0.8 kilometers (0.5 miles) west of the proposed 121-hectare (300-acre) site.

The primary land uses for a site zoned “agricultural” are cropland and pasture. Because the J.K. Smith Site is a private site, owned and operated by EKPC, there are no current farming practices occurring onsite. There are no commercial or community facilities onsite. The industrial uses within the J.K. Smith Site include a natural gas field, with four producing gas wells, two nonproducing gas wells, and five natural gas pipelines owned by Tennessee Gas Pipeline Company. The predominant land uses within 8 kilometers (5 miles) of the project site are cropland and pasture, forest, and shrub/brush rangeland. Several small residential areas surrounding the perimeter of the J.K. Smith Site are zoned residential.

The proposed route for the 138-kilovolt (kV) line extends northeasterly from the project site to the Spencer Road Terminal in Montgomery County, Kentucky, where it will interconnect with the existing local power grid. The proposed new transmission line would be approximately 27 kilometers (17 miles) in length; however, the exact route for the line has yet to be determined. The terrain is typified by gently rolling hills and the land cover is predominately agricultural.

4.3 Socioeconomics

This section describes current socioeconomic conditions within a region of influence (ROI) where the majority of the Kentucky Pioneer IGCC Demonstration Project workforce is expected to reside, based on proximity to the site and historic employment patterns. The ROI is a three-county area in Kentucky comprised of Clark, Fayette, and Madison Counties (Figure 4.3-1). The ROI covers an area of 2,538 square kilometers (980 square miles) around the project site (Census 1994).

The ROI established is only applicable for this resource area and the traffic and transportation study. Social and economic impacts are distributed over a wider area, which is reflected in the selection of a comparatively larger area of analysis. The larger area is due to the fact that individuals who travel from as far away as Lexington, for example, to work on the site will not use their disposable income solely within Clark County. Rather, they would spend most of it closer to their homes. This is where the economic impact would be experienced.

4.3.1 Employment and Income

Fayette County is primarily urban and is comprised of the city of Lexington. The remaining counties in the ROI are largely rural in character. Employment by sector over the last decade has changed slightly, as shown in Table 4.3-1. The service sector provides the highest percentage of the employment in the ROI, almost 30 percent, followed closely by the wholesale and retail trade and government sectors, with 23 percent and 16.3 percent, respectively. Farm employment has decreased over the last decade, providing 2.9 percent of employment in 1990 but only 2.2 percent in 1997 (BEA 1999). Table 4.3-1 presents employment levels for the major sectors of the ROI economy.

Table 4.3-1. Employment By Sector (Percent)

Sector	1990	1997
Services	26.4	29.8
Wholesale and Retail Trade	22.3	23.0
Government and government enterprises	17.8	16.3
Manufacturing	12.5	11.7
Construction	5.6	5.8
Finance, insurance, and real estate	6.6	5.0
Transportation and public utilities	4.2	4.3
Farm employment	2.9	2.2
Mining	0.2 ^a	0.2
Other Sectors	1.5	1.7

^a Percentage only includes Clark and Fayette Counties. Data for Madison County not available.
Source: BEA 1999.

The ROI experienced stable growth throughout the 1990s. The labor force grew from 174,303 in 1990 to 200,848 in 2000, an average annual growth rate of 1.5 percent. Employment growth outpaced labor force growth, increasing from 166,834 in 1990 to 196,619 in 2000, an average annual growth rate of 1.8 percent. The ROI unemployment rate was 4.3 percent in 1990, falling to 2.1 percent in 2000, as shown in Table 4.3-2. The average unemployment rate for the State of Kentucky was 4.1 percent in 2000 (BLS 2000, KDES 2000).

Table 4.3-2. Region of Influence Unemployment Rates (Percent)

	1990	2000
Clark County	6.8	3.0
Fayette County	3.6	1.8
Madison County	6.0	2.7
ROI Total	4.3	2.1
Kentucky	5.9	4.1

Source: BLS 2000, KDES 2000.

Kentucky Counties

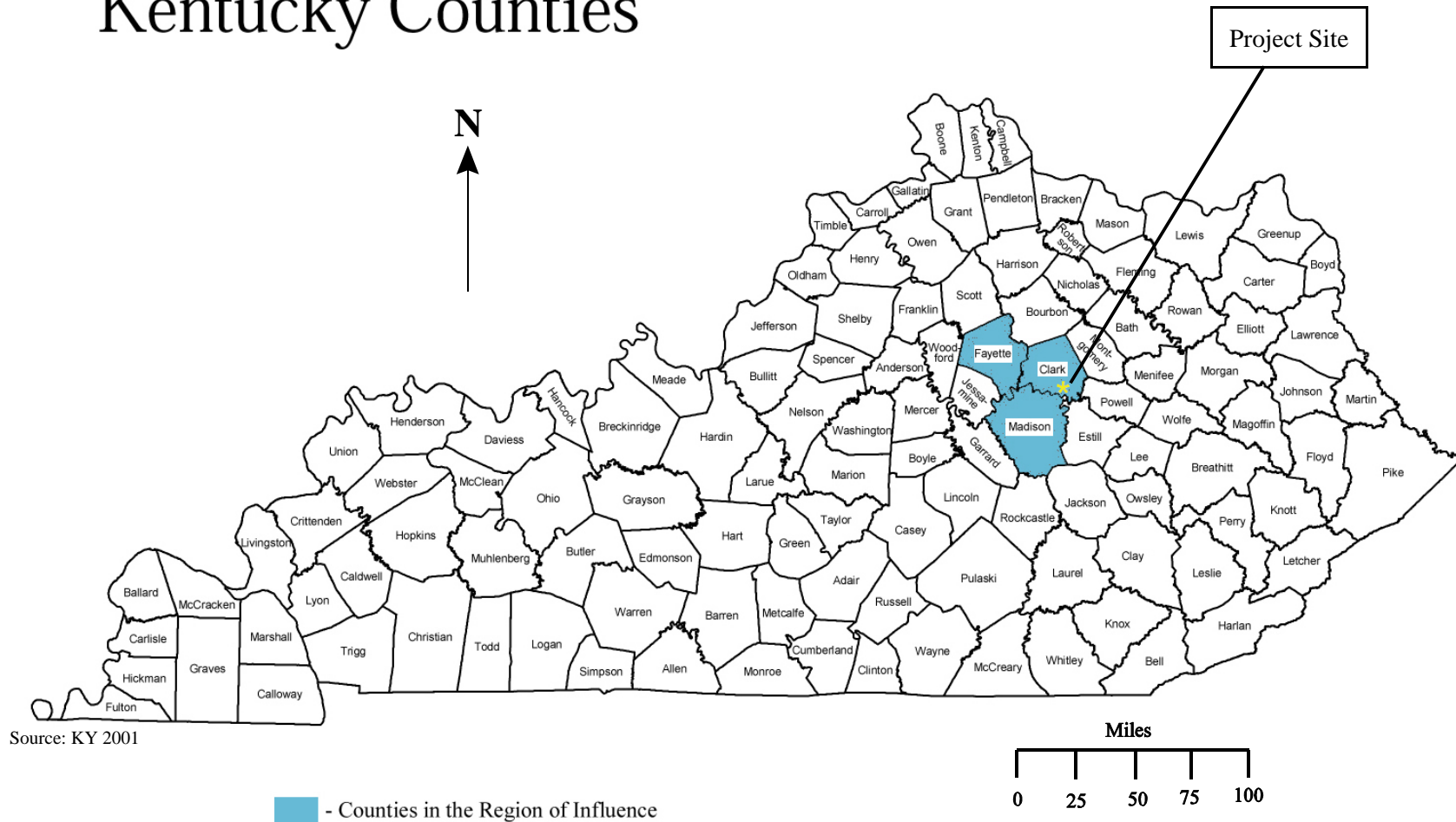


Figure 4.3-1. Location of Socioeconomic Region of Influence for Kentucky Pioneer IGCC Demonstration Project

Per capita income in the ROI was \$25,515 in 1997, more than a 37 percent increase from the 1990 level of \$18,351. Per capita income ranged from \$18,249 in Madison County to \$28,045 in Fayette County. The per capita income in Kentucky averaged \$20,570 in 1997 while the U.S. average was \$25,288 (BEA 1999).

4.3.2 Population and Housing

Over the last 20 years, population has grown at a much higher rate in the ROI compared to the State of Kentucky. ROI population increased 9.3 percent between 1980 and 1990 and an additional 16.7 percent between 1990 and 2000. The population of Kentucky increased less than 1 percent between 1980 and 1990 and 9.6 percent between 1990 and 2000. ROI population is projected to continue growing, increasing 4.4 percent between 2000 and 2010 compared to the state rate of 4.8 percent. Table 4.3-3 presents historic and projected population in the ROI and the state.

Table 4.3-3. Historic and Projected Population

	1980	1990	2000	2010
Clark County	28,322	29,496	33,144	34,602
Fayette County	204,165	225,366	260,512	271,975
Madison County	53,352	57,508	70,872	73,990
ROI	285,839	312,370	364,528	380,567
Kentucky	3,660,777	3,686,892	4,041,769	4,235,774

Source: Census 1995, Census 2000a, Census 2000c, Louisville 2000.

Year 2010 projections based on established rates applied to 2000 census counts.

Lexington, in Fayette County, is the largest city in the ROI with a 2000 population of 260,512. Other cities include Richmond and Berea in Madison County, with 2000 populations of 27,152 and 9,851, respectively, and Winchester in Clark County with a 2000 population of 16,724 (Census 2000c).

Table 4.3-4 presents housing characteristics in the ROI. There were a total of 130,833 housing units in the ROI in 1990. More than 60 percent of these houses were single-family units, approximately 35 percent were multifamily units, and 5 percent were mobile homes. Approximately 8 percent of the housing units were vacant. Approximately 56 percent of the occupied units were owner-occupied while 44 percent were rental units.

Table 4.3-4. Region of Influence Housing Characteristics

	Total Number of Housing Units	Number of Owner- Occupied Units	Owner- Occupied Vacancy Rates (Percent)	Median Value	Number of Occupied Rental Units	Rental Vacancy Rates (Percent)	Median Monthly Contract Rent
Clark County	11,635	7,492	1.0	\$56,900	3,481	7.5	\$264
Fayette County	97,742	47,460	2.6	\$73,900	42,069	9.8	\$338
Madison County	21,456	12,422	1.3	\$55,500	7,590	8.8	\$249
ROI	130,833	67,374	2.2	NA	53,140	9.5	NA

Source: Census 1992.

In 1990, the median value of owner-occupied housing in the ROI ranged from \$55,500 in Madison County to \$73,900 in Fayette County. The median monthly rent ranged from \$249 in Madison County to \$338 in Fayette County.

4.3.3 Community Services

This assessment presents the availability of public schools, law enforcement and fire and medical services in the project's ROI.

The four school districts serving the ROI are Clark, Fayette, and Madison Counties and Berea Independent. These districts utilize approximately 2,075 teachers to educate 48,500 students. There are also more than 20 private schools in the ROI educating an additional 4,050 students (KDE 2000). There are a number of institutions of higher learning in the ROI, including the University of Kentucky and Eastern Kentucky University.

The Clark, Fayette, and Madison Counties' Sheriff's departments as well as the Berea, Lexington, Richmond, and Winchester Police Departments provide law enforcement services for the ROI. The Clark County Sheriff's Office, comprised of 10 officers and the Sheriff, is responsible for law enforcement in the vicinity of the project site. The office is located in Winchester, approximately 19 kilometers (12 miles) from the proposed construction site.

There are four professional and five volunteer fire departments located in the ROI. Clark and Fayette Counties each have one professional department and Madison County has two professional departments. There are 27 professional and 5 volunteer fire stations and more than 40 fire trucks throughout the ROI. The majority of the stations and trucks, as well as all of the aerial units and seven of the eight emergency response units are located in Fayette County, where the majority of the population is concentrated. Over 130 fire personnel are available per shift in Fayette County while Madison County employs a total of 43 fire personnel. Madison County utilizes approximately 100 volunteers through 4 professional and 4 volunteer stations.

The Clark County Fire Services would be directly responsible for an emergency at the proposed site. Clark County houses 2 fire stations that utilize 6 trucks and 21 professional and 20 volunteer fire personnel and 2 separate trucks manned by 2 volunteers each. Both stations are located in the town of Winchester and are between 12 and 13 miles from the proposed site. Average response time to an emergency situation or fire from these two stations to Trapp would be approximately 10 to 15 minutes. One of the volunteer trucks is located in Trapp and a new county station is set to begin construction near the J.K. Smith Site outside of Trapp in the near future, which will help to reduce the response time to any potential emergency during the proposed construction.

The 8 emergency response units also service the 13 hospitals located in the ROI. There are approximately 110 physicians servicing the almost 2,900 combined beds in these hospitals (AHA 1995). The majority of the hospitals are located in the city of Lexington in Fayette County.

4.4 Cultural Resources

Cultural resources are those aspects of the physical environment that relate to human culture and society, and those cultural institutions that hold communities together and link them to their surroundings. Cultural resources include expressions of human culture and history in the physical environment such as prehistoric or historic archaeological sites, buildings, structures, objects, districts, or other places including natural features and biota which are considered to be important to a culture, subculture, or community. Cultural resources also include traditional lifeways and practices, and community values and institutions.

The cultural resources present in Kentucky demonstrate the prehistoric use of the region for over 10,000 years; the early Euroamerican settlement, pre-Civil War regionalism, Civil War history, postbellum industrialization, and developments between the World Wars and the Modern era. Kentucky is one of the most active states with regard to the identification of cultural resources and the promotion of responsible stewardship of the cultural heritage of the commonwealth.

4.4.1 Cultural Resource Types

Cultural resources have been organized into the categories of prehistoric resources, historic resources, and traditional cultural properties (TCPs) and practices. These types are not exclusive and a single cultural resource may have multiple components. Prehistoric cultural resources refer to any material remains, structures, and items used or modified by people before the establishment of a Euroamerican presence in the region. Historic cultural resources include architectural resources and other material remains and landscape alterations that have occurred since the arrival of Euroamericans in the region. TCPs and practices refer to places or activities associated with the cultural heritage or beliefs of a living community, which are important in maintaining cultural identity.

4.4.2 Cultural Resource Regulations

The identification of cultural resources and DOE responsibilities with regard to cultural resources are addressed by a number of laws, regulations, executive orders, programmatic agreements and other requirements. The principal federal law addressing cultural resources is the *National Historic Preservation Act* (NHPA) of 1966, as amended (16 United States Code [USC] 470), and implementing regulations (36 *Code of Federal Regulations* [CFR] 800) that describe the process for identification and evaluation of historic properties; assessment of the effects of federal actions on historic properties; and consultation to avoid, reduce, or minimize adverse effects. The term “historic properties” refers to cultural resources that meet specific criteria for eligibility for listing on the National Register of Historic Places (NRHP). This process does not require preservation of historic properties, but does ensure that the decisions of federal agencies concerning the treatment of these places result from meaningful considerations of cultural and historic values and of the options available to protect the properties.

Under the NHPA, cultural resources undergo an evaluation process to determine whether a resource is eligible for listing on the NRHP. Resources that are already listed, determined eligible for listing, or are undetermined are afforded a level of consideration under the NHPA Section 106 review process. Undetermined resources are those for which eligibility cannot be determined based on current knowledge of the resource and where further work is needed to make an evaluation.

In order to be determined eligible for listing on the NRHP, a resource must meet one or more of the following criteria (36 CFR 60):

- Criterion A – associated with events that have made a significant contribution to the broad patterns of our history.
- Criterion B – associated with the lives of persons significant in our past.
- Criterion C – embodied the distinctive characteristics of a type, period, or method of construction.

Criterion D – yielded or may be likely to yield information important in prehistory or history.

The resource must also retain most, if not all, of the seven aspects of integrity: location, design, setting, workmanship, material, feeling, and association.

The identification and evaluation of cultural resources for NRHP-eligibility is the responsibility of the lead federal agency with the concurrence of the State Historic Preservation Officer (SHPO), in this case the Kentucky Heritage Council. The Advisory Council on Historic Preservation, an independent federal agency, administers the provisions of Section 106 of the NHPA regarding cultural resources and has review and oversight responsibilities defined in 36 CFR 800. It should be noted that the provisions of the NHPA refer only to cultural resources that are tangible properties and that federal agencies are required by other statutes to consider impacts on traditional cultural and religious practices.

4.4.3 Cultural Resources of the Proposed Facility Location

Extensive cultural resource identification work was conducted in support of the J.K. Smith EA in 1980 (Turnbow and Jobe 1981). The initial work consisted of a literature review and a pedestrian survey for archaeological and architectural resources of the entire 1,263-hectare (3,120-acre) EKPC property, which includes the 121-hectare (300-acre) proposed Kentucky Pioneer IGCC Demonstration Project facility location. As a result of these investigations, 231 archaeological sites and 33 standing structures were documented and recommendations were made regarding further work. Seventy-three archaeological sites were identified in proposed construction areas, and fieldwork was conducted at 44 of these to determine NRHP eligibility. All 13 standing structures in the construction areas for the earlier project were evaluated at that time as not meeting the criteria for NRHP eligibility. After further evaluation fieldwork, it was determined that three archaeological sites met the criteria for NRHP eligibility and adverse effects were subsequently mitigated through data recovery excavations under the terms of an agreement with the SHPO (Turnbow and Jobe 1981). There were no additional studies or consultations conducted to identify cultural landscapes, ethnographic or TCP resources. The Section 106 review process was completed in concurrence with the SHPO prior to the initiation of grading and other site preparation activities for the J.K. Smith facility. Resources identified outside of the construction areas, including the NRHP-listed Brock House, were not impacted at that time. Results of the cultural resource work performed on the site are summarized in *Cultural Resource Investigations of the J.K. Smith Power Station* and recovered artifacts have been curated at the William S. Webb Museum at the University of Kentucky in Lexington (Turnbow and Jobe 1981).

Consultation with the Kentucky Heritage Council has determined an appropriate identification effort for the proposed Kentucky Pioneer IGCC Demonstration Project. The Kentucky SHPO has confirmed that the Section 106 review process was completed for the Kentucky Pioneer IGCC Demonstration Project's Area of Potential Effect in December of 1980. The terms of the Memorandum of Agreement drawn up in conjunction with the Advisory Council on Historic Preservation for the J.K. Smith Power Station have been met under the Kentucky Pioneer IGCC Demonstration Project and further identification, evaluation, mitigation, and consultation activities are no longer required. The Area of Potential Effect includes the 121-hectare (300-acre) J.K. Smith project site and any additional potential disturbance areas such as borrow pits, construction laydown areas, or utility, transportation and transmission line corridors. The Area of Potential Effect also includes consideration of the potential for visible, audible, and atmospheric alterations to the setting of off-site cultural resources. The proposed project site is entirely within the construction area which was examined for cultural resources and subsequently graded for construction of the J.K. Smith facility. The potential for the existence and discovery of intact prehistoric or historic archaeological resources that would meet NRHP eligibility requirements is considered very low. Likewise, no Native American or other traditional use areas or religious sites are known to be present or are expected in the proposed project area. The precise location of any additional disturbance areas such as transmission line corridors has not yet been defined. As these areas are defined, an appropriate cultural resource identification effort and assessment of effects will be conducted.

4.5 Aesthetic and Scenic Resources

This section describes the visual character of the Kentucky Pioneer IGCC Demonstration Project and briefly discusses the scenic areas in the vicinity of project site.

The project site is located on the edge of the Outer Bluegrass and Knobs Physiographic Regions. The Knobs Region is characterized by subconical hills while the Bluegrass Region is a central lowland. The project site subconical and surrounding area is managed and owned by EKPC. The project site is located 1.6 kilometers (1 mile) west of the community of Trapp, Kentucky. As discussed in Section 4.2, Land Use, additional areas within the 1,263-hectare (3,120-acre) J.K. Smith Site are being utilized by EKPC. Near the project site, EKPC owns and operates three gas turbines on approximately 19 hectares (48 acres) of land. The turbines are located on the J.K. Smith Site approximately 0.8 kilometers (0.5 miles) west of the proposed 121-hectare (300-acre) project site.

4.5.1 Visual Character of the Kentucky Pioneer IGCC Demonstration Project Facility Site

The 121-hectare (300-acre) project site is located within the 1,263-hectare (3,120-acre) J.K. Smith Site that is accessed through a gated perimeter fence and access road. The project site has been previously disturbed. Preliminary grading, primary foundations, fire protection piping, and rail access infrastructure already exist on the site. Although many project facilities are visible from Kentucky Highway 89, all facilities are located approximately 0.8 kilometers (0.5 miles) from the highway.

4.5.2 Scenic Areas

There are 19 designated scenic byways located throughout the State of Kentucky. However, none of these scenic byways are located within Clark or Madison County.

There are nine sections of river designated as Kentucky Wild Rivers, which cover approximately 182 kilometers (114 miles). These rivers are characterized by undisturbed shorelines and vistas. The Red River, which runs through the Daniel Boone National Forest, is the closest Kentucky Wild River to the project site. The Daniel Boone National Forest is 24 kilometers (15 miles) east of the project site. A 14.4-kilometer (9-mile) stretch of the Red River, located within the Daniel Boone National Forest, is also designated as a National Wild and Scenic River. The Red River joins the Kentucky River approximately 2.4 kilometers (1.5 miles) south-southeast of the project site.

The proposed route for the 138-kV line extends northeasterly from the project site to the Spencer Road Terminal in Montgomery County, Kentucky, where it will interconnect with the existing local power grid. The proposed new transmission line would be approximately 27 kilometers (17 miles) in length; however, the exact route for the line has yet to be determined. Based on the general area within Clark and Montgomery Counties, the proposed route is not expected to cross any scenic areas.